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Planar Adhesive Closure Piece

The invention relates to a planar adhesive closure piece for an adhesive fastener in which fastening elements corresponding to each other may be detachably engaged with each other, with a base fabric of warp filaments and weft filaments and with at least one functional filament which extends at least partly through the base fabric and which configures the fastening elements.

Woven adhesive fastener portions the warp, weft, and functional filaments of which may consist of textile fibers but also of plastic or metal fibers are readily available on the market in a plurality of embodiments. The functional filaments form loop-like hooking elements in the base fabric of warp and weft filaments if they are made of multifilament threads. If the functional filaments consist of monofilament threads and if the respective closed loops are cut open or separated from each other by thermal means, fastener hooks are obtained which may be engaged with a correspondingly configured fleece loop material of the other fastening element. If in the separating process the free loop ends are subjected to heat treatment, for example, if they are melted open, mushroom-shaped fastener heads are obtained as fastening elements as a result of the inherent behavior of the plastic material. The possibility also exists of engaging hook-shaped or mushroom-shaped fastener portions with felt-like adhesive fastening elements so that the two elements may be separated.

Very good peeling resistance values can be achieved with the disclosed adhesive fastener systems, that is, relatively high forces are required in order to pull apart the corresponding planar adhesive fastener portions forming the adhesive fastener to discontinue the connection. However, since the fastening elements of the corresponding fastener portions assume a specific orientation relative to each other, an orientation which is regular from the statistical viewpoint, it has been found in practical applications that after an initial adherence threshold has been crossed the fastener may be easily disengaged, since in the respective common orientation the fastening elements adhering to each other readily slide apart and break the connection.

In order to counter this US Patent 5,040,275 proposed for a cast adhesive fastener portion that the fastening elements be configured in sinusoidal paths, each fastening element consisting of a U-shaped hooked pair provided at its free ends with a mushroom head. In addition, spacing is maintained transversely to the sinusoidal path between the U-shaped fastening elements positioned transversely thereto so that the fastener heads may withdraw into the respective clear space so that a suitably configured fastening element may be received and engaged as free of resistance as possible in formation of the adhesive fastener, for example, also one in the form of a mushroom-shaped hook configuration. As a result of the sinusoidal path in question in the instance of the cast fastener, in which the U-shaped hook elements are cast in a base-matrix material, the rapid slipping off during opening of the fastener in a direction of stripping is prevented, since the respective sine wave forces force yielding of the corresponding fastener hook introduced, something which results in an obstruction and accordingly in increase in the peeling resistance values. In an improved configuration of this solution (US 6,076,238) provision has additionally been made such that the hooking pattern with the fastening elements may be configured Achaotically@ in predetermined model patterns, that is, such that the fastening elements are arranged on the base fabric as randomly as possible, in order thus to achieve an effect comparable to that obtained with the sinusoidal configuration. However, the respective

cast plastic fastener cannot be produced as fabric with warp and weft filaments and production of this disclosed fastener is complex and cost-intensive.

On the basis of this state of the art the object of the invention is to produce a planar adhesive fastener portion as a woven fastener in a cost-effective manner, the fastener nevertheless having higher adherence values for the fastening elements than the fasteners hitherto produced in weaving technology with their fastening elements. This object is attained with a planar adhesive fastener portion having the features specified in claim 1 in its entirety.

In that, as specified in the characterizing part of claim 1, either the warp filaments and/or the weft filaments is/are configured to be wave-shaped or curved, the linear orientation on the fastening elements of the adhesive fastener previously extending in one direction is avoided and the curved configuration presents a clearly defined resistance to the disengagement movement of the corresponding fastening elements, so that the retaining forces are essentially constant and thus may also be calculated, while the peeling resistance values are distinctly increased in relation to the disclosed solutions, which are made up of fabrics with warp and weft filaments. By preference the respective part of the curve or wave is configured as a sinusoidal or cosinusoidal wave.

In an especially preferred embodiment of the adhesive fastener portion claimed for the invention the weft filaments exclusively are configured to extend in the form of bights in the base fabric, the respective weft filament extending in alternating sequence above a warp filament and below the warp filament immediately following. Reliable fastening of the weft filaments in the basic fabric structure is thereby achieved, while the warp filaments, which extend in a linear direction, suitably support the weft filaments in the base fabric.

In another especially preferred embodiment of the adhesive fastener portion claimed for the invention the respective functional filament extends at least in part between two adjacent warp filaments in the base fabric, extending below every fourth weft filament and over the other weft filaments. By preference provision is also made such that, in place of the extension below the base fabric of the functional filaments, a loop is formed above the base fabric and such that another loop is formed immediately after it.

The respective loops may serve as fleece material for engaging other hooking elements, but they may also form the fastener hooks after being cut open or thermally separated. By preference the functional filament consists of a monofilament which is suitably resistant to the detaching forces and provides the engagement and disengagement forces for the adhesive strip fastener it is desired to produce.

Other advantageous embodiments are specified in the subsidiary claims.

The adhesive fastener portion claimed for the invention is described in greater detail below with the aid of an exemplary embodiment illustrated in the drawing, in which

FIG. 1 shows a top view of the fabric of the adhesive fastener portion claimed for the invention;

FIG. 2 shows a side view of the planar adhesive fastener portion shown in FIG. 1.

FIG. 1 shows a top view of a section of the planar adhesive fastener portion claimed for the invention. The adhesive fastener portion in question may be extended as desired in the plane of the drawing in one or the other direction of the illustration, while the geometric dimensions of

the planar formation depend on the values assigned to the weaving mechanism in which the adhesive fastener portion is produced. The adhesive fastener portion consists of warp filaments 10 and weft filaments 12 which are interwoven in a transverse configuration to form the base fabric 14 for the adhesive fastener portion. The base fabric 14 is also configured with functional filaments 16 as pile threads. The respective functional filament 16 then forms the individual fastening elements 18 for the planar adhesive fastener portion.

It is also to be seen in the line of sight to FIG. 1 on its upper side that an arrow 20 indicates the direction of production of the adhesive fastener portion. In the configuration shown in FIG. 1 the respective weft filaments 12 are configured to be curved as a sine or cosine wave and at the intersections of warp filaments 10 and weft filaments 12 the warp filaments 10 extend in parallel with the direction of production 20 and in parallel with each other in a rectilinear arrangement. In the instance of embodiments not shown of the adhesive fastener portion it would also be possible to arrange the warp filaments 10 additionally or alternatively in a curved configuration. In order for the weft filaments 12 to follow a curved path as shown in FIG. 1, the producing loom (not shown) provided for the purpose has a suitably curved reed insert in the form of the sine or cosine wave required. Consequently, the adhesive fastener claimed for the invention may be made available in large quantities at a high production speed and the sinusoidal or cosinusoidal reed (not shown) engages the respective base fabric 14 transversely to the direction of production 20 to produce the curved weft filament pattern.

In the embodiment shown in FIG. 1, however, only the weft filaments 12 are arranged so as to extend in a curved pattern in the base fabric 14, the respective warp filament 12 alternately extending in sequence above a warp filament 10 and below the next one immediately following. The respective functional filaments 16 extend at least partly between two adjacent warp filaments 10 in the base fabric 14; in the configuration shown in FIG. 1 they extend in sequence below every fourth weft filament 12 and above the other weft filaments 12. In place of the

respective extension under the base fabric 14 the functional filament 16 forms a superposed loop 22, another loop 24 being formed immediately after it, so that a sort of V-shaped weave is produced. However, other weave forms are also conceivable, such as tying the functional element 16 in the form of a W or the like.

The loops 22, 24 in question form the fastening elements 18 and if the loops 22, 24 remain closed as illustrated, a sort of fleece adhesive fastener portion is obtained, it being possible for hook-shaped or mushroom-shaped fastening elements to engage the respective loops 22, 24 in order to obtain a detachable adhesive fastener. The possibility also exists, however, of cutting the loops 22, 24 open to produce a fastener hook which may engage corresponding nonwoven or fleece material of another fastening element not shown. If the separation or cutting process is carried out by thermal means, and if the free loop ends in particular are additionally heated, the ends shrink to form mushroom-shaped fastener hooks, so that the fastener hooks may also be mushroom-shaped (not shown). It accordingly is also possible to produce combined fasteners, that is, ones with hook-shaped and loop-shaped elements on a common base fabric 14.

As is shown by FIG. 2 in particular, an individual weft filament 12 may also consist of a pair of weft filaments or be in the form of multiple filaments. This applies to the warp filaments 10 as well, which are shown by the cross-sectional view in FIG. 2 to extend alternately above a pair of weft filaments 12 and then below this weft filament pair 12. The respective functional or pile thread 16 misses one weft filament pair 12 and then extends over the two following weft filament pairs 12 in the sequence shown.

As is also to be seen in the two illustrations, the other loop 24, in order to extend below the base fabric 14, extends below a weft filament 12, which, as viewed in the line of sight to FIG. 1, is displaced by two warp filaments 10 and two weft filaments 12 laterally from the point at which the preceding loop 22 is positioned on the base fabric 14. Consequently, the loops of the

first type 22 and of the other type 24 are positioned on the base fabric 14 so as to be offset from each other, the loops of the first type 22 forming essentially closed O-shaped loops while the loops of the other type 24 are configured to be V-shaped or U-shaped. A so-called repeat is effected for a functional filament 16 in the direction of the weft filaments 12 after five warp filaments 10. In addition, the filament systems may consist of textile fibers, but by preference are made of a plastic material, nylon or polypropylene in particular. The possibility also exists of using metal fiber systems at least in part for the fastener as illustrated claimed for the invention.

The wave-shaped configuration of the weft filaments 12 makes it possible to obtain increased resistance in the direction of peeling during such peeling, and accordingly in release of the fastener by way of the correspondingly offset configuration of the loops 22, 24 also configured as hook material, something which favors the fastening force behavior and thus results in high fastening and peeling strength values for the fastener.

In addition, it is possible to set the adherence values for the fastener to be as constant as possible, as a function of the configuration of the fastener selected, so that the adhesive fastener may always be detached by application of the same detaching force.